

Educational and Vocational Shops

Industry Overview

Many educational and vocational institutions do not produce hazardous waste. If, however, you use ignitable solvents, strong acid alkaline solutions, heavy metals, or toxic organic chemicals, the waste you generate might be hazardous. If you generate hazardous waste, you might be subject to Resource Conservation Recovery Act (RCRA) requirements covering the generation, transportation, and management of hazardous waste.

Educational and vocational institutions include shops conducting:

- Automotive and small engine repair
- Automobile body repair
- Metalworking
- Graphic arts production (e.g., printing and photography)
- Woodworking.

Waste generated by laboratories is not addressed in this pamphlet; a separate pamphlet on laboratory waste is available.

Hazardous Wastes from Educational and Vocational Shops

The majority of hazardous waste from educational and vocational shops are:

Solvents (e.g., paint removers, thinners, and cleaning solvents)

Paint waste

Strong acid or alkaline solutions (e.g., cleaning solutions).

Automobile body repair and woodworking operations generate waste solvents and paints. The solvents might be flammable or toxic, and paints might contain heavy metal pigments or hazardous solvents. Metalworking and automotive repair generate waste solvents and acid or alkaline solutions used to clean metal and remove rust.

Graphic arts production can generate several types of waste, depending on the activities. Printing wastes include strong acid solutions used to clean, etch, and coat plates, and solvents used to clean plates, to apply light-sensitive coatings, and to develop plates. The use of inks generates waste containing solvents and/or heavy metals. Photographic wastes include processing solutions, developers, hardeners, and fixing baths. Photographic processing waste might be toxic, ignitable, or corrosive.

RCRA regulations contain special provisions for spent lead-acid batteries and used oil, which might be generated in automotive shops and other shops with heavy machinery. You do not have to use a Manifest when you ship used lead batteries that are destined for recycling or used motor oil that is destined for recycling. If, however, you are disposing of used oil yourself or are sending it offsite for disposal, you generally should handle it as hazardous waste because it is likely to be ignitable or toxic. Special requirements apply if you are burning used oil as fuel. Your state might have its own requirements for lead-acid batteries or used oil; check with your state hazardous waste management agency.

Table 1 lists general operations/processes that use hazardous materials and that might result in the generation of hazardous waste. If you generate 100 kilograms (220 pounds or about half of a 55-gallon drum) or more of hazardous waste per month, you must fill out a Uniform Hazardous Waste Manifest when you ship the hazardous waste off your property. The Manifest requires the proper Department of Transportation (DOT) description for each waste. Table 2 lists proper DOT shipping descriptions for a number of wastes that might be generated by educational and vocational shops. Table 1 and Table 2 are not comprehensive lists. If you do not find your waste here but suspect it is hazardous, contact your EPA Regional office or state hazardous waste management agency for additional information.

Waste Minimization

An effective waste minimization program can reduce the costs, liabilities, and regulatory burdens of hazardous waste management, while potentially enhancing efficiency, product quality, and community relations. Waste minimization techniques that can help you reduce the amount of hazardous waste that you generate include:

- Production planning and sequencing
- Process/equipment adjustment or modification
- Raw material substitution
- Loss prevention and housekeeping
- Waste segregation and separation
- Recycling.

Training and supervision of employees implementing waste minimization techniques is an important part of your successful program. Call the RCRA/Superfund Hotline toll-free at 800-424-9346 (or TDD 800-553-7672 for the hearing-impaired) for waste minimization information and publications.

Table 1
Typical Educational and Vocational Shops Operations:
Materials Used and Hazardous Wastes that Might be Generated

Process/Operation	Materials Used	Typical Material Ingredient	General Types of Waste Generated
AUTOMOBILE ENGINE AND BODY REPAIR, METALWORKING			
Oil and grease removal; metal/tool cleaning; engine, parts, and equipment cleaning	Solvents, carburetor cleaners, degreasers, cleaning fluids, acids/alkalies, engine cleaners	Petroleum distillates, aromatic hydrocarbons, mineral spirits, benzene, toluene, petroleum naphtha	Ignitable waste Solvent waste Combustible solids Waste acid/alkaline solutions
Rust removal	Naval jelly, strong acid/alkaline solutions	Phosphoric acid, hydrochloric acid, hydrofluoric acid, sodium hydroxide	Waste acid/alkaline solutions
Painting	Enamels, lacquers, epoxies, alkyds, acrylics, primers	Acetone, toluene, petroleum distillates, epoxy ester resins, methylene chloride, xylene, VM&P naphtha, aromatic hydrocarbons, methyl isobutyl ketones	Ignitable paint waste Solvent waste Paint waste with heavy metals Ignitable waste
Spray Booth, Spray Guns, Brush Cleaning; Paint Removal/Paint Preparation	Solvents, paint thinners, enamel reducers, white spirits	Acetone, toluene, petroleum distillates, methanol, methylene chloride, isopropanol, mineral spirits, alcohols, ketones, other oxygenated solvents	Ignitable paint waste Heavy metal paint waste Solvent waste
Changing Lead-Acid Batteries	Car, truck, boat, motorcycle, and other vehicle batteries	Lead dross, less than 3% free acids	Lead-acid batteries Strong acid/alkaline solutions
Changing Oil, Lubricating Machinery	Petroleum products	Motor oil, gasoline, lubricants	Used oil
GRAPHIC ARTS - Plate Preparation			
Counter-etching to Remove Oxide	Phosphoric acid	Phosphoric acid	Acid/alkaline waste
Deep-etch Coating of Plates	Deep etch bath	Ammonium dichromate, ammonium hydroxide	Acid/alkaline waste Heavy metal waste
Applying Light Sensitive Coating	Resins, binders, emulsion, photo-sensitizers, gelatin, photo-initiators	PVA/ammonium dichromate, polyvinyl cinnamate, fish glue/albumin, silver halide/gelatin emulsion, gum arabic/ammonium dichromate	Photographic processing waste
Developing Plates	Developer	Lactic acid, zinc chloride, magnesium chloride	Photographic processing waste
Washing/Cleaning Plates	Alcohols, solvents	Ethyl alcohol, isopropyl alcohol, methyl ethyl ketone, trichloroethylene, perchloroethylene	Solvent waste
Applying Lacquer	Resins, solvents, vinyl lacquer	PVC, PVA, maleic acid, methyl ethyl ketone	Solvent waste
Ink Use	Pigments, dyes, varnish, drier, extender, modifier	Titanium oxide, iron blues, molybdated chrome orange, phthalocyanide pigments, oils, hydrocarbon solvents, waxes, cobalt/zinc manganese oleates, plasticizers	Waste ink and ink sludges with chromium or lead
Making Gravure Cylinders	Acid plating bath	Copper, hydrochloric acid	Plating waste
Painting	Solvents, paint with solvents, heavy metals	Ethylene dichloride, benzene, toluene, ethylbenzene, chlorobenzene, methyl ethyl ketone	Ignitable waste Toxic waste Paint waste
WOODWORKING			
Wood Cleaning and Wax Removal	Petroleum distillates, white spirits	Petroleum distillates, mineral spirits	Ignitable waste Solvent waste
Refinishing/Stripping; Brush Cleaning and Spray Gun Cleaning	Paint removers, varnish removers, enamel removers, shellac removers, paint solvents, turpentine	Acetone, toluene, petroleum distillates, mineral spirits, methanol, methylene chloride, alcohols, ketone, oxygenated solvents	Ignitable waste Toxic waste Paint waste Solvent waste
Staining	Stains	Mineral spirits, alcohols, pigments	Ignitable waste Solvent waste
Painting	Enamels, lacquers, epoxies, alkyds, acrylics, primers, solvents	Toluene, pigments, titanium dioxide, epoxy-ester resins, aromatic hydrocarbons, glycol ether, halogenated hydrocarbons, vinyl acetate acrylic	Ignitable waste Toxic waste Paint waste Solvent waste
Finishing	Varnish, shellac, polyurethane, lacquers	Denatured alcohols, resins, shellac, petroleum distillates, toluene diisocyanate	Ignitable waste Toxic waste Solvent waste

Table 2
Educational and Vocational Shops Waste Descriptions¹

Waste Type	Designations/Trade Names	DOT Shipping Name	Hazard Class	UN/NA ID Number
PHOTOGRAPHIC WASTES				
Carbon Tetrachloride*	Carbon Tetrachloride, Perchloromethane, Necatorina, Benzinofom, CCl ₄	Waste Carbon Tetrachloride	ORM-A	UN1846
Heavy Metal Solutions	Photographic processing waste containing heavy metals	Hazardous Waste Solution containing Cadmium, Chromium, Lead, and/or Cyanide	ORM-E	NA9189
SPENT SOLVENTS AND OTHER TOXIC OR IGNITABLE WASTES CONTAINING:				
Acetone	Acetone	Waste Acetone	Flammable Liquid ²	UN1090
White Spirits	White Spirits, Mineral Spirits, Naphtha	Waste Naphtha Waste Naphtha, Solvent Waste Naphtha, Solvent	Combustible Liquid ³ Flammable Liquid Combustible Liquid Flammable Liquid	UN2553 UN2553 UN1256 UN1256
Petroleum Distillate	Petroleum Distillates	Waste Petroleum Distillate	Combustible Liquid Flammable Liquid	UN1268 UN1268
Kerosene	Kerosene, Fuel Oil #1	Waste Kerosene	Combustible Liquid	UN1223
Methylene Chloride	Dichloromethane, Methane Dichloride, Methylene Bichloride, NCI-C50102, Solaesthin, Aerothene, Narkotil, Solmethine	Waste Dichloromethane or Methylene Chloride	ORM-A	UN1593
Toluene	Toluene, Methacide, Methylbenzene, Methylbenzol, Phenylmethane, Toluol, Antisal 1A	Waste Toluene (Toluol)	Flammable Liquid	UN1294
Benzene*	Benzene, Benzol	Waste Benzene (Benzol)	Flammable Liquid	UN1114
Ethanol	Ethanol, Ethyl Alcohol	Waste Ethyl Alcohol	Flammable Liquid	UN1770
Xylene	Xylene, Xylol	Waste Xylene	Flammable Liquid	UN1307
Tetrahydrofuran	Tetrahydrofuran, THF	Waste Tetrahydrofuran	Flammable Liquid	UN2056
Isopropanol	Isopropanol, Isopropyl Alcohol	Waste Isopropanol	Flammable Liquid	UN1219
Ethyl Benzene	Ethyl Benzene	Waste Ethyl Benzene	Flammable Liquid	UN1175
1,1,1-Trichloroethane	1,1,1-Trichloroethane, Aerothene TT, Chlorten, Inhibisol, Trichloroethane, Chloroethene NU, NCI-C04626, Methylchloroform, Chlorothene VG, Chlorothane NU, Chlorotene	Waste 1,1,1-Trichloroethane	ORM-A	UN2831
Trichloroethylene*	Perm-A-Chlor, Trielin, Triline, Trioal, Vestrol, Chlorylene, Dow-Tri, Vitran, TCE, Nialk, Philex	Waste Trichloroethylene	ORM-A	UN1710
Ethylene Dichloride*	Ethylene Dichloride, 1,2-Dichloroethane	Waste Ethylene Dichloride	Flammable Liquid	UN1184
Chlorobenzene*	Chlorobenzene, Monochlorobenzene, Phenyl Chloride	Waste Chlorobenzene	Flammable Liquid	UN1134
Methyl Ethyl Ketone*	Methyl Ethyl Ketone, Methyl Acetone, Meetco, Butanone, Ethyl Methyl Ketone, MEK, 2-Butanone	Waste Methyl Ethyl Ketone	Flammable Liquid	UN1193
WASTE INK WITH SOLVENTS OR HEAVY METALS				
Waste Ink	Various ingredients: Carbon Tetrachloride, Chloroform, Methylene Chloride, 1,1,1-Trichloroethane, 1,2-Dichloroethane, Benzene, Toluene, Ethyl Benzene, Tetrachloroethylene, Trichloroethylene, Chromium, Copper, Lead, Zinc, Cyanide, Aluminum, Cadmium, Nickel, Cobalt	Waste Ink	Combustible Liquid Flammable Liquid	UN2867 UN1210
INK SLUDGE WITH CHROMIUM OR LEAD				
Ink sludge with Chromium or Lead	Ink sludge containing heavy metals	Hazardous Waste, Liquid, NOS ⁴ Hazardous Waste, Solid, NOS	ORM-E ORM-E	NA9189 NA9189

Table 2 (continued)
Educational and Vocational Shops Waste Descriptions¹

Waste Type	Designations/Trade Names	DOT Shipping Name	Hazard Class	UN/NA ID Number
STRONG ACID/ALKALINE WASTES				
Ammonium Hydroxide	Ammonium Hydroxide, NH ₄ OH, Spirit of Hartshorn, Aqua Ammonia	Waste Ammonium Hydroxide (containing not less than 12% but not more than 44% ammonia)	Corrosive Material	NA2672
		Waste Ammonium Hydroxide (containing less than 12% ammonia)	ORM-A	NA2672
Hydrobromic Acid	Hydrobromic Acid, HBr	Waste Hydrobromic Acid	Corrosive Material	UN1788
Hydrochloric Acid	Hydrochloric Acid, HCl, Muriatic Acid	Waste Hydrochloric Acid	Corrosive Material	NA1789
Hydrofluoric Acid	Hydrofluoric Acid, HF, Fluorohydric Acid	Waste Hydrofluoric Acid	Corrosive Material	UN1790
Nitric Acid	Nitric Acid, HNO ₂ , Auafortis	Waste Nitric Acid (over 40%)	Oxidizer	UN2031
		Waste Nitric Acid (40% or less)	Corrosive Material	NA1760
Phosphoric Acid	Phosphoric Acid, H ₃ PO ₄ , Orthophosphoric Acid	Waste Phosphoric Acid	Corrosive Material	UN1805
Potassium Hydroxide	Potassium Hydroxide, KOH, Potassium Hydrate, Caustic Potash, Potassa	Waste Potassium Hydroxide Solution	Corrosive Material	UN1814
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1813
Sodium Hydroxide	Sodium Hydroxide, NaOH, Caustic Soda, Soda Lye, Sodium Hydrate	Waste Sodium Hydroxide Solution	Corrosive Material	UN1824
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1823
Sulfuric Acid	Sulfuric Acid, H ₂ SO ₄ , Oil of Vitriol	Waste Sulfuric Acid	Corrosive Material	UN1832
Chromic Acid	Chromic Acid	Waste Chromic Acid Solution	Corrosive Material	UN1755
Lacquer, Paint, or Varnish Removing Liquid	Lacquer, Paint, or Varnish Removing Liquid	Waste Compound, Lacquer, Paint, or Varnish Removing Liquid	Corrosive Material	NA1760
SPENT PLATING WASTES				
Spent Plating Wastes	Spent etch baths, spent plating solutions and sludges, stripping and cleaning baths	Hazardous Waste, Liquid, NOS	ORM-E	NA9189
		Hazardous Waste, Solid, NOS	ORM-E	NA9189
OTHER IGNITABLE AND/OR TOXIC WASTES				
Paint Dryer	Paint Dryer	Waste Paint Dryer, Liquid	Combustible Liquid Flammable Liquid	UN1168 UN1168
Paint, Enamel, Lacquer, Stain, Shellac, or Varnish; Aluminum, Bronze, Gold, Wood Filler, Liquid or Lacquer Base, Liquid	Paint, Enamel, Lacquer, Stain, Shellac, or Varnish; Aluminum, Bronze, Gold, Wood Filler, Liquid or Lacquer Base, Liquid	Waste Paint, Enamel, Lacquer, Stain, Shellac, or Varnish; Aluminum, Bronze, Gold, Wood Filler, Liquid or Lacquer Base, Liquid	Combustible Liquid Flammable Liquid	UN1263 UN1263
Enamel	Enamel	Waste Compound, Enamel	Flammable Liquid	NA1263
Lacquer, Paint, or Varnish Removing, Reducing, or Thinning Liquid	Lacquer, Paint, or Varnish Removing, Reducing, or Thinning Liquid	Waste Compound, Lacquer, Paint, or Varnish, Removing, Reducing, or Thinning Liquid	Combustible Liquid Flammable Liquid	NA1142 NA1142
PAINT WASTES WITH HEAVY METALS				
Paint Waste	Paint Waste with Heavy Metals	Hazardous Waste, Liquid, NOS	ORM-E ORM-E	NA9189 NA9189
IGNITABLE WASTES NOT OTHERWISE SPECIFIED (NOS)				
Ignitable Wastes, NOS	Ignitable Wastes, NOS	Waste Flammable Liquid, NOS	Flammable Liquid	UN1993
		Waste Combustible Liquid, NOS	Combustible Liquid	NA1993
		Waste Flammable Solid, NOS	Flammable Solid	UN1325
Hazardous Wastes, NOS		Hazardous Wastes, Liquid, Solid, NOS	ORM-E	NA9189

* Toxicity Characteristic constituent. Any waste that results in a TCLP extract containing a Toxicity Characteristic constituent equal to or above regulatory levels is hazardous.

1 These descriptions may change given variations in waste characteristics or conditions. Note that the DOT shipping name, hazard class, and UN/NA ID number do not directly correspond to RCRA categories of hazardous waste. 3 A combustible liquid has a flash point between 100°F and 200°F.

2 A flammable liquid has a flash point below 100°F.

4 NOS - not otherwise specified.

For further information call the RCRA/Superfund Hotline 1-800-424-9346